

WATER-LEVEL MOVEMENTS AS AN INDICATOR OF FOREST-FIRE WEATHER¹

By DAVID G. THOMPSON

The water-level movements in a well as obtained by automatic gage, have been put to a new use in New Jersey. In an attempt to determine what constitutes "good fire weather" and predict the likelihood of forest fires, Mr. A. D. Follweiler of the forestry division of the State department of conservation and development has been making a study of the relation between meteorologic conditions and the number and size of fires each day during the fire seasons, which occur in the spring and fall. Observations are being made of barometric conditions, precipitation, relative humidity, wind velocity and direction, temperature, and sky conditions.

On certain days when other conditions indicated the fire hazard to be great, the number of fires was unexpectedly small and the question arose as to the influence of soil moisture in keeping the underbrush damp. A study of the record of the fluctuation of water level in a shallow well, in which the water level ranges $3\frac{1}{2}$ feet to less than 1 foot below the surface, showed that on these

days the water level was high. Recently, when the water level was lower, there were bad fires. The well record is now being furnished regularly to the forestry division.

The nearness of the water level to the surface in the locality of the observation well probably does not in itself exert a direct influence in preventing fires, for even within a few hundred yards, due to surface configuration, the water table lies so far below the surface that there can be no upward capillary movement to keep the surface moist. Rather, it is merely an indication of general moisture conditions. Doubtless it would be more significant to make determinations of the moisture content of samples of the surface foot of soil in localities where the water table is both near the surface and at a considerable depth below it, but it has not been possible to do this.

A comparison is also being made between the stream-flow and the number of fires. So far this seems to indicate a relation similar to that existing in the comparison with ground water conditions, presumably because the ground-water and surface-water conditions are so interrelated.

¹ Communicated to the editor by the Director of the U. S. Geological Survey. Mr. Thompson is a geologist in the water resources branch of that survey.—Ed.

TORNADOES IN KANSAS, JULY 16, 1927

[Condensed from reports furnished by P. Connor and B. R. Laskowski]

Kansas City and vicinity.—The morning weather map showed a zone of relatively low pressure about 500 miles wide from Lake Superior southwest to the Texas Panhandle, with readings ranging from 29.80 to 29.90 inches. An area of high pressure overspread the Southeast and another was centered over the northern Rocky Mountain region. The line of demarcation between the surface air drifts from the north and the south, extended directly from a little east of St. Paul and Duluth southwestward a little west of Omaha, Concordia, Dodge City, and Amarillo.

The morning temperatures were ordinary generally, perhaps a little below normal. Rains occurred the night before in the middle Missouri Valley and Minnesota, while clear sky appeared over the Southwest.

Locally, it was a day of uncertain weather, cloudy until 1 p. m. with a thunderstorm in forenoon. Then the clouds began to clear away as if all trouble had passed, only to reassemble again before 4 p. m., leading to the approach of a thunderstorm from the west of rather ominous appearance.

The first thunder was heard at 4:10 p. m. Rain began at 4:17 and ended at 5:27 p. m., the total amount being 0.34 inch. The wind was gentle. There was nothing in the instrumental registration in the Weather Bureau office to indicate that anything of a destructive character had taken place.

The tornado formed about 1 mile west of Monrovia, a small farm and gardening settlement in Johnson County, Kans., at 4:45 p. m.

No one reported having seen a funnel-shaped cloud, but a few persons claimed to have seen a "whirling cloud dip and bounce."

According to many witness the storm had been threatening for some time. Thunder was heard a half-hour before the tornado formed. From Monrovia witnesses saw two great black clouds traveling from opposite directions which "met with a crash of thunder." The air suddenly became oppressive and a copperish haze spread over the scene of "collision." Some heard a moan, others the noise of a train. Most of them, however, were not

alarmed by what they heard, taking it for the approach of a thunderstorm.

It was preceded by a rather heavy downpour of rain.

From Monrovia the tornado traveled about 3 miles northeastward, a little to the north of Shawnee and Merriam, Kans., to South Park, a small settlement along the Kansas City-Olathe Highway, about 2 miles southwest of Rosedale, Kans., where it caused its greatest destruction, and apparently where its energy dissipated. Its path was about 4 miles long and about 600 feet wide.

Some persons and newspapers have stated that it reasserted itself a little later in the extreme southern part of Kansas City, Mo., where quite a little damage was done, beginning about Eighty-third and Main Streets, and extending about $1\frac{1}{2}$ miles northeastward, its path being about 500 feet wide.

The writer, although admitting the possibility of this, is unwilling to accept the statement as a fact, for the reason that in order to have done so, it would have had to be transposed at the cloud level nearly 6 miles on a southeast line, from where it disappeared on the Kansas side while moving in a northeast direction. The writer would prefer assuming that it was a result of a secondary concentration of forces, an independent development, which visited the southern section of Kansas City, Mo., as the parent disturbance moved eastward.

Damage first began at Monrovia. From there to the edge of South Park the ground is high, a country district. Two dwellings were totally destroyed and about 18 damaged. Several barns and chicken houses were wrecked; large limbs of trees were torn off here and there and a few trees blown down.

South Park is in a narrow valley. The houses are small, in most cases frail frame structures; a few stucco cottages and there was one 2-story brick building, part stores and part dwelling quarters.

About 20 dwellings were destroyed and about 35 others had the sides torn off, the whole or parts of roofs and porches were carried away and chimneys were blown down. Some large trees were uprooted and large limbs were broken off the trunks of many others. There was